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## TWO PEDAGOGICAL PROBLEMS.

### I. CAN THE HISTORY OF THE UNITED STATES BE MADE INTERESTING?

The American people are not much given to retrospection. They are too young and too busy. And even if they were to pause, as the nineteenth century lies dying, and look back at its varied achievements, it may be doubted whether they would weigh them correctly. They have an instinct for numerical and mechanical greatness, and would scarcely fail to notice our growth in these and similar directions; but I suspect that in the midst of the bewildering improvements in all practical arts, few persons would realize or appreciate the wonderful progress that has been made in the art of teaching. Yet no art has advanced more rapidly. Persuasion has taken the place of compulsion; and work that is dull has given place to work that is interesting, without loss of mental discipline. The object of schools is no longer to furnish the necessity but the opportunity for work. The birch rod and the drive-it-in method have given way to splendid laboratories and all kinds of helping apparatus. Every device that human ingenuity can contrive is now brought to bear on the student to arouse his dormant faculties and lead him to exert himself. Voluntary, eager, independent work is the ideal of modern pedagogics.

This change of methods has revolutionized all departments of instruction. Webster's famous old blue-backed spelling book has been supplanted by fascinating reading charts. Languages are no longer a grammatical grind. Students now learn to talk French and German instead of talking about them. Political economy is no longer restricted to metaphysical generalities, but deals with questions of lively, present interest. In the teaching of history also great improvement has been made. Not so very long ago his-

tory was, in the strictest sense, "book-learning." The expression "History of the United States" then signified not the marvellous series of events that have made our nation, but a book — a green book or a red book — with about three hundred pages to be learned by heart and recited by rote; and the attitude of the average teacher is well illustrated by the case of one who had applied for a position and was being examined by the proper authorities. Question after question was asked him and he missed them all. Finally, a member of the examining board exclaimed, "Sir, how do you expect to teach history without knowing anything about it?" "Well," he replied, "you see when I am teacher, I have the book." With the book in one hand and rod in the other he was ready to give thorough instruction according to the plan usual in his day — a little at a time and rub it in.

From the barren manuals of that day it is a long step forward to modern books like those of Eggleston, Montgomery, Fiske, Thomas, and others, with their luxurious paraphernalia and the accompanying wall charts, progressive maps and collateral reading. But I think we are still inclined to stick too closely to our books. We still make our history too exclusively book learning, and for that reason many active, earnest young men fail to find in it the vital interest they have a right to expect. Now it seems to me that this ought not to be, and I will venture to suggest several ways in which it may be remedied.

Our colonial and revolutionary history never seemed to me so vivid, if I may cite my own experience, as when one summer I visited Boston and gazed on its historic landmarks: Faneuil Hall, Bunker Hill, and Old South Church with its quaint relics. I felt that I was looking on the footprints of history. Nor has the political history of our country ever appeared so real and so fascinating as when I have visited Washington and seen the wheels of government actually revolving. I was fortunate enough, for example, to be in the House when Mr. Wilson read Mr.

Cleveland's famous letter, and, as I watched the exciting scenes that followed on that day and the next, I felt that no novel could be half so absorbing as our political history, when one actually got in touch with it. Places like these give the same sense of living reality to history that its laboratories do to practical sciences. They exhibit theory in the concrete. When the student visits them he realizes that history is more than the anatomical study of the dead past. Why should he not do so oftener? In the East the plan has already been put into practice and seems to be growing in popularity under the name of "Historical Pilgrimages." Cheap rates are secured, and parties of students visit a series of historical spots, where instructive lectures are given by eminent men. These tours need not be expensive. In this day of cheap excursions why cannot a few teachers and pupils for a reasonable amount go frequently on short educational trips? Moreover it is a growing custom in large colleges to take the classes in practical science to some neighboring city to examine electrical or mechanical plants, and see the theories they have been studying put into actual operation. This is a good plan, but why should it be limited to students of practical science? It is to be hoped the day will soon come when it will be possible for advanced classes in American history to make an educational visit at least to the capital of their State, and to have the various departments of government explained to them. Nothing else would so arouse their interest in its past and future welfare.

The next suggestion to be made is in regard to an old failing which, in spite of recent improvement, still characterizes us oftener than is supposed. We regard United States history too much as a series of facts to be memorized—facts selected at haphazard and having no connection. The main object should be not to memorize but to understand them, which is much harder than is commonly supposed. To do it properly one must select the really important events, and that is a nice matter. It requires much

careful thought and investigation to trace out the real currents in the eddying stream of history.

To illustrate, it may be held to be almost certain that the Northmen discovered this continent centuries before Columbus lived, but a little reflection and investigation will convince any one that the whole matter was of small importance to us, because it exercised no more influence on the stream of our history than the alleged visit of the Chinaman, Hœi Shin, in the fifth century. Similarly, the tremendous importance assigned to the Stamp Act and the Tea Tax has been considerably diminished by recent historians, who recognize that these, while perhaps the most conspicuous, were only a part of a long series of unwise and unjust acts, in which, for years, the misunderstanding between England and the Colonies had been manifesting itself more and more clearly. The firing on Fort Sumter, too, was once called the cause of the Civil War, but the more closely we study the period just preceding that revolution, the further we can trace its coming. The causes for it lie far back in our history. The firing on Fort Sumter was simply its first outbreak, and should not be allowed to dwarf in importance the long series of antecedent steps by which the two sections diverged.

The student of history must have an eye for proportion. And that implies something very different from a sense of literary grace. It means that events must be assigned their true position, and to do this their full meaning and importance must be understood. But the student, and especially the young student, finds this very hard to do. He is not inclined to reflect very seriously on the consequences of things, either in his own life or in the life of his country; and while by nature he may be warm-hearted, yet he has not learned to sympathize with men and contests that are past. He requires something more than mere logical explanation to help him realize their force and make his heart beat faster as he reads about them. Something must be done to put him in touch with the great events of our history, to bring them home to him.

A plan that I have found to work well is to approach the past from the standpoint of the present; to use current events to kindle an interest in those that are more remote. Take for instance Monroe's administration which strikes the student as a sleepy subject when introduced as the "Era of Good Feeling," but at a time like the present becomes instantly a subject of lively interest when associated with the "Monroe Doctrine." Again, the Genet affair may be enlivened by comparison with the milder but more recent Sackville incident. So the question of religious freedom, which is constantly demanding attention, especially in our colonial period, ceases to be a mere abstraction when illustrated by the present Armenian atrocities. There is scarcely a conspicuous current event that cannot be made to throw a flood of light on some point of our history. For instance, the overthrow of the Roseberry Ministry in England furnished a fine opportunity to compare our system of party government with the English. And the comparison might have been made again when President Cleveland was urging Congress to repeal the "Sherman Law," and later to pass the "Wilson Bill," by pointing out that had he been Prime Minister, he could in each case have dissolved Parliament and appealed to the country.

In this connection a word may be said about our financial history. Most students, especially young students, have very hazy ideas on finance. The words "banking," "bonds," "currency," and "tariff," are to them algebraic symbols of unknown quantities, and so far as they occur in history are treated as such. To the average student's mind they are interesting, if at all, only as mathematical problems, having no direct connection with life and no immediate importance. And too often this remote point of view is confirmed by a teacher who knows little about such matters, and inclines to regard them as mere catch words used for some political trickery. To get rid of this abstract view of financial history, its immediate connection with human joys and sorrows must be shown. The ques-

tion of wages and boycotts loses its dryness when one reads of the riots at Chicago, and just so my students find the fluctuations in the price of cotton interesting because they realize that it means bread and meat at home and teaching at school Pitt and Gladstone made financial matters interesting because they kept them out of the realm of mere arithmetic, and made them constantly questions of direct public welfare.

There is a third way in which the dead past may be made to live again. At a recent gathering of the poet Browning's friends a phonograph was set in their midst and the voice of the dead poet was heard repeating his masterpiece: "How they brought the Good News from Ghent to Aix." Tears sprang to their eyes. They seemed to be in his very presence, because they caught the accents of his voice. We unfortunately cannot employ the phonograph to catch the tones of voice of the great men of our past. But we can catch other personal peculiarities that make them seem just as human and lifelike. We cannot appeal to the phonograph, but we have their apt sayings, their confiding journals, and many free and easy letters written by them or about them. It is by such glimpses as these that their real character becomes known. Franklin is epitomized in his famous remark as he signed the Declaration of Independence: "Gentlemen, we must all hang together, or we shall hang separately." Hamilton stands revealed as by a lightning flash in his contemptuous exclamation: "The people! The people, sir, is a great beast." And what a flood of light is cast on both Sir Edmond Andros and the sturdy Puritans over whom he tried to tyrannize, by his tilt with the preacher. "Well, sir," said Sir Edmond, as he was about to leave one of their towns, "I suppose you are all praying for my departure?" "Yes," replied the Puritan preacher, "we read in Scripture that this kind goeth not out but by fasting and prayer." Some of Dolly Madison's letters, too, give to the men of that time an effect of flesh and blood that we seek for in vain in the histories; and no one can read Judge Sewell's

Diary without laughing and crying, and loving him like a family physician.

Had I been writing this paper ten years ago I might have omitted my next suggestion; but in the last decade "Original Work" has assumed such importance that it cannot be quietly ignored in an enumeration of the charms of historical study.

Of the importance already attached to it in academic circles there can be no doubt. The various departments in our large universities and in many colleges issue their regular series of "Studies;" and professorial chairs are now won and kept, not so much by wide scholarship or liberal culture as by independent research. Just now, original work is the fad, and in the rush after it the real value of much that is turned out is lost sight of. Men forget that the average student, even in our large universities, is not able, and never will be able, to contribute very much to what is known on any subject, historical or other. The average reader does not care for such work, and the real expert either already knows more about the subject than the writer, or is afraid to trust the monograph to save himself from even the most mechanical part of research. As a matter of fact the numberless monographs that pour from the college presses find their value not so much in the information they give the reader as in the intellectual training they give the producer, and most of them have already accomplished their mission before they even reach the types.

But when we view the subjective effect of this work, its value appears at once. For the writer himself such training is necessary. No man is a specialist in any branch of scholarship simply because he knows what other men have done in it. Neither is one trained in history when he has merely learned what others think about past events. Be the result good or ill, he must learn to think for himself, must form his own opinions and find the reasons for them. Until he has done this, he is a dreamer and knows and feels it, and history seems to him an unreal, bookish thing, offer-



ing no sphere for a manly, vigorous mind, presenting no field for healthy, independent thought. The average American has no desire to be a mere book-worm. He feels that his mind is more than a scrap-book; and if the study of history be only the pasting in of other men's thoughts, he soon becomes weary of it. A course of instruction that gives him no way to think his own thoughts about historical matters, as he has been accustomed to think them about other things, he finds stale and flat.

Indeed, I think one reason why our young men do not feel more interest in history, is that we do not encourage them to independent thought early enough. We ought to have more of it, not only in our colleges but in our schools. We have a false idea that students must be drilled and drilled in the dogmas of history before they are allowed to use their own natural sense. An essay is perhaps assigned on some famous character, but is commonly regarded more as an essay in English than in history, and attention is devoted rather to correct expression than to detecting salient points in the man's career. Oftentimes the essay is regarded as a kind of examination, and, once handed in, is never seen again. The shortcomings are not explained, and a better way of handling the subject is not specified.

But I cannot close this paper without a plea for a department of history, now too much neglected. We hear much of institutions and laws; and even that fascinating subject, the manners and customs of the people, has at last received some attention. Men are beginning to realize that as the true progress of law reflects the education of public sentiment, so the history of politics cannot be understood without knowledge of the changes in the every day life and thoughts and feelings of the people. But perhaps the greatest, the noblest field for historic work is still but poorly cultivated. I mean biography.

Lately we have been hearing much of the scientific study of history. Perhaps it has become more accurate,

more systematic, more free from personal bias and empty rhetoric than it used to be ; and it certainly has learned to trace with marvellous acuteness the gradual coming of things. Revolutions have become evolutions. But this has not diminished the size of the really great men of history. On the contrary, by a clear exposition of their surroundings, they have been made vastly more real and interesting. They are a more fascinating study than ever before, and yet biography is still the most backward branch of history, and a good "life" is as rare in literature as in fact — a life that shows the man. No teacher has made his pupils masters of a mathematical principle until they can solve the fresh problems involving it. No biographer has made his readers really acquainted with his hero unless they can tell what he would do under varying circumstances. Then, as in real life, they know their man. There may be much they do not know about him, but they understand him.

Yet in spite of the shortcomings of the biographers, no department of history can be made so interesting and so profitable as theirs. The best beginning is the life of some man of our own time, in whom we are already interested. This nearness to us gives a reality to the story and leads us easily to others more remote. My pupils instinctively read of Lee and then are willing to take up Washington.

But even here there should be every possible check on mere bookishness. The best help to the study of biography is acquaintance with great men. Now we cannot each of us have a great man for laboratory purposes, but we may do all we can to study those nearest us, study their lives, watch their careers, follow their struggles in the papers. Let us not take our biography all cut and dried, but let us investigate for ourselves. The study of the life of a man like Cleveland or Blaine, which is both interesting and profitable, is excellent practical work in biography.

American history ought not to be dry. There is no reason why it should not be the most interesting as well as the most profitable of all studies. Sir Walter Scott breathed

on the dry bones of history and they came to life. His imagination played over the past, and castles rose from their ruins, warriors pranced across the plains, and the rugged hills rang again with the clansman's cry. Our history ought to be as interesting as Scotland's. The fault lies not in the history but in ourselves that we do not see it. We have waked up to the fact that we have the greatest country on the face of the globe. Some day we shall realize that we have the most interesting history.

What field of history contains more of real romance and adventure than the stories of Cortez and Pizarro and their Spanish contemporaries? Where can we find more quaint and amusing customs than in our colonial history? What nation presents a clearer field for the study of the problems that confront a people trying to live the life of the free and the just? What other country has ever, in so short a time, presented for study so many important and interesting problems in finance as ours?

Do we like biography? What other history can furnish greater names than ours, stretching as they do from quaint and shrewd old Benjamin Franklin to his more modern counterpart, Abraham Lincoln? Do we revel in the storm and stress of the battlefield? The Revolutionary War is to us what the Trojan War was to the Greeks. There is about it the glow that retrospective patriotism always casts over the birth struggles of a great nation. And no war could be fuller of romance and pathos and tragedy than our Civil War.

If any intelligent young man or woman does not find American history interesting, the fault is to be sought, not in the history itself, but in the method employed in teaching it.

GEORGE PETRIE.

## II. MODERN METHODS OF TEACHING GEOMETRY.

By "geometry" in this article is meant Euclidian geometry, and what we shall say does not refer in any way to modern geometry, descriptive geometry, or any other branch of mathematics; nor are we going to enter upon any discussion concerning questionable axioms or dubious proofs. We wish to call attention solely to the manner in which certain modern authors give the demonstration of their theorems.

During a number of years of experience in teaching geometry the impression has been growing on the writer that there is a radical defect in many of our modern text-books on geometry. The defect to which we refer grows out of the apparent efforts on the part of certain writers "to make the subject easy," and they do this at the expense of vigor and beauty, greatly weakening the science as a mental drill. Our meaning will be clearer as we proceed.

It is natural that any attempt to make mathematics easy should meet with favor. The world at large would be only too glad to believe that Euclid's answer to King Ptolemy, "Sire, there is no royal road to geometry," no longer holds true. And yet the mathematician knows that it is as true now as in the days of Ptolemy, though Newton and Leibnitz, by discovering the calculus, made the road much smoother. Such a text-book as Wentworth's,<sup>1</sup> though admirable in many respects, does, we claim, by the very arrangement and wording of the demonstrations, make the way, in a sense, so easy that the pupil does not get any thing like that mental discipline that the study of geometry ought to give.

Now just here some one is ready to hold up his hands and exclaim, "Are you such an old foggy as to wish to

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<sup>1</sup> *New Plane and Solid Geometry.* By G. A. Wentworth. Ginn & Co., Boston.

make the pathway of the student hard?" Certainly, if thereby his mind can get that exercise so needful for battling with more abstruse problems later on in his mathematical course. Just as many a sin of omission is clothed with the garb of conservatism, so, on the other hand, he who either wilfully courts popularity, or honestly errs in his judgment, seeks to cover up his sins by the cry of "progress," "modern methods," etc. What would the grand old army of geometers, Thales, Pythagoras, Plato, Euclid, and the like, think of the pages of some of our modern geometries, looking rather algebraic than geometric? It seems to us that they would deplore this as much as they would welcome true mathematical advancement. To arrive at a just conclusion, let us candidly ask a few questions.

What do we study Euclidian geometry for? Is it only for acquiring a knowledge of a certain number of facts and processes? Or is it rather as an intellectual exercise? If for the former, then we had best arrive at the desired facts in the easiest and shortest way. If, on the other hand, it is a pure science, useful mainly as a mental exercise to develop the reasoning powers of the youthful mind, then, by all means, do not let us weaken it by trying "to make it easy." Now in trigonometry we are seeking results, and it is right and proper to arrive at the results in the simplest legitimate way. The proofs may profitably be made, we think, as simple and clear as possible. Right here we see the difference. While the student of geometry does acquire many practical facts as to areas, volumes, etc., (many of which he has already made use of in his arithmetic or mensuration), yet will not every teacher admit that over and above the good accruing from the possession of such facts is the inestimable benefit of geometry as a mental drill? Professor Halsted, in the preface to his "Elements of Geometry," says rightly: "Besides the acquirement of facts, there properly belongs to geometry an educational value beyond any other elementary subject. In it the mind first finds logic a practical instrument of real power."

We admire the inscription that Plato is said to have put over the entrance to his school, "Let none ignorant of geometry enter my door," and we cannot help having some sympathy with him in his objection to the mechanical devices of Archytas, "because they detracted from the value of geometry as an intellectual exercise." This great geometer and philosopher, to use the words of Professor Cajori, "said that geometry trained the mind for correct and vigorous thinking."<sup>1</sup>

We would not for a moment lose sight of the practical applications of geometry or of any other branch of mathematics, and while we wish to emphasize our point, that it is the mental exercise afforded by its study rather than the accumulation of many facts and processes that we seek, we would call attention to the fact that even from this point of view it is an eminently practical study. There seems to be a frequent misunderstanding of the true meaning of the word "practical;" some being inclined to restrict it to mechanical or manual work. We need not revert to the discoveries that can be traced directly to the attempts to solve the impossible problems, owing to limitations imposed, of the tri-section of an angle, the duplication of the cube, and the squaring of the circle; and certainly no one would dare to estimate the amount of mental power developed in those investigations. But enough has been said on this point. We would not go back to the mathematics of the Egyptians who carried geometry no further than was absolutely necessary for their practical wants.

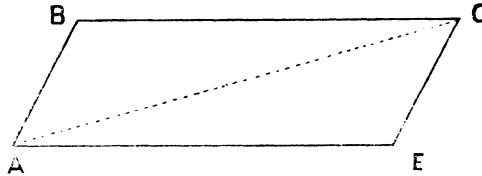
Now, in order to show that certain modern authors do, in their effort at simplicity, weaken this study which is so powerful in preparing youth for any field of mental activity, let us take one or two examples.

As Wentworth is at once, perhaps, the most popular author and one of the chief offenders, we shall contrast his book with that of Chauvenet or of Venable, taking a few simple propositions, picked out at random.

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<sup>1</sup>*A History of Mathematics.* By F. Cajori. Macmillan & Co., New York.

(A) THEOREM: — If the opposite sides of a quadrilateral are equal, the figure is a parallelogram.



Let the figure ABCE, be a quadrilateral having BC equal AE and AB equal EC. To prove ABCE a parallelogram. This theorem occurs as Prop. 40, Book I., in Wentworth's Geometry, and Prop. 32, Book I., in Venable's Geometry.

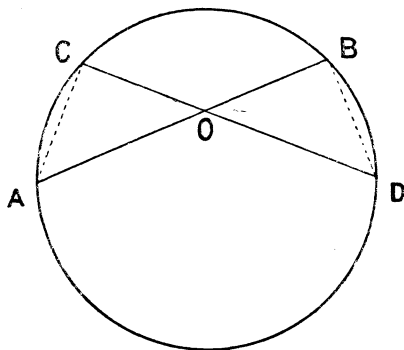
First, as to Wentworth's proof. This author proceeds to prove by showing that the three sides are equal, that, triangle ABC equals triangle AEC, giving the reference "§ 160," and stating in the next line the reason why this equality exists, (having the sides of the one equal respectively, etc.,) from which it follows that angle ACB equals angle CAE, and angle BAC equals angle ACE. Mr. Wentworth does not leave it to the pupil to draw this inference, for before the latter has time to think about it, he reads "being homologous angles of equal triangles." Therefore BC is parallel to AE, and AB is parallel to EC. Here again not content with giving the reference "§ 105," the pupil is told at once before he has a chance to see it for himself, why BC is parallel to AE and AB to EC, and the reason for the final conclusion, that ABCE is a parallelogram is given in the next line. It is evident that it is easily possible for the pupil at the blackboard to prove correctly the proposition, stating every step and giving reason at every point without understanding one word of it; that is, he could memorize such a proof as he would a verse of poetry. Let us now consider another form of the proof.

Mr. Venable's proof of the same proposition is about as follows: The two triangles BAC, ACE, have the three sides

of the one equal to the three sides of the other, each to each, therefore they are equal; hence, the angle  $BCA$ , opposite the side  $AB$ , is equal to the angle  $CAE$ , opposite to the side  $EC$ ; therefore (Prop. 25) the side  $BC$  is parallel to  $AE$ . For a like reason,  $AB$  is parallel to  $EC$ ; therefore, the quadrilateral  $ABCE$  is a parallelogram.

Here a few questions from the instructor will soon show whether or not the pupil has got into the spirit of the proof and knows what he is talking about. Enough is said to make one step follow naturally on another, and yet enough is left unsaid to make the pupil think a little for himself. There seems to us to be a marked difference between the two ways of presenting the demonstration. Space forbids, however, our giving a complete analysis of the differences in this or in the following example:

(B) THEOREM:—If any chord is drawn through a fixed point within a circle, the product of its segments is constant in whatever direction the chord is drawn.



Let any two chords  $AB$  and  $CD$  intersect at  $O$ .

To prove  $OA$  multiplied by  $OB$  equals  $OD$  multiplied by  $OC$ .

Draw  $AC$  and  $BD$ .

This theorem occurs as Prop. 20, Book III., of Wentworth's Geometry and Prop. 17, Book III., of Chauvenet's Geometry.



As in the first example, the references will be made clear by examination of the texts.

Mr. Wentworth's proof is about as follows, his exact words being given only in those places where we wish to call attention to his form.

In the triangles AOC and BOD angle C equals angle B, §263 (each being measured by one-half arc AD) angle A equals angle D, (same reference is given and similar reason assigned). Therefore the triangles are similar, §322 (two triangles are similar when two angles of the one are equal to two angles of the other.)

Whence

$$OA : OD :: OC : OB$$

Therefore

OA multiplied by OB equals OD multiplied by OC.

§295.

Mr. Chauvenet, on the other hand, after the preliminary statement, etc., says that the triangles AOC, BOD, are similar, having the angles at O equal, and also the angles A and D equal (II, 58) ;

Therefore

$$OA : OD :: OC : OB$$

Whence (5),

OA multiplied by OB equals OD multiplied by OC.

Again, note the difference between the two proofs. Unquestionably the former is for the time *easier* for the pupil, and also *easier* for that teacher who is content with conducting the recitation in a perfunctory manner.

Passing over the careful statement of hypothesis and conclusion (which feature in Wentworth's proofs we heartily commend), and the construction of the auxiliary lines, and coming to the proof that the triangles AOC and BOD, are equal, the pupil is told that

angle C equals angle B,

and on the same line the reference, §263, is given. But before he has time to ask himself the question, "why is angle C equal angle B?", just below, in full view, is given the reason.

(each being measured by one-half arc BD) and so for the reason why angle A equals angle D.

It follows (§322) that the triangles are similar, but, according to Prof. Wentworth's plan, it will not do to let the pupil do any independent thinking at this point, so the reason why the triangles are similar is immediately given (two triangles are similar when etc).

Now look at the second form of the proof, as given by Chauvenet. After the statement of the hypothesis and conclusion, each step in the proof is given in a perfectly clear and logical manner, and enough references are given to enable even a dull pupil to follow the reasoning without unnecessary loss of time, but he *must* employ his reasoning faculties not only to understand the proof, but to be able to give a reason for each inference. Memorizing will, in this case, not help him to stand the test that he would be put to by a live teacher. For other examples the reader is referred to the geometries quoted, a careful examination of which is invited.

As Venable and Chauvenet are, in this respect, very much alike, we shall hereafter speak only of Chauvenet. We were led to mention the two because of this similarity and of their general excellence as text-books.

Now the difference between the form of the two styles of demonstrations seems slight, but the difference is there.

Wentworth leaves nothing for the pupil to do,—he does all the thinking, the pupil simply reads, and, we fear, too often crams and memorizes.

Chauvenet makes the pupil think with him. He may have to read one of Chauvenet's sentences twice or even thrice, and perhaps (something a lazy student does not like to do) to refer back to a previous proposition. But it is the effort to grasp the logic of the proof that makes the man and the mathematician.

Wentworth does not encourage independence on the part of the pupil. We say this notwithstanding the elegant and complete selection of exercises that he has so wisely

put at the end of each book, and, in some cases, along through the books. Wentworth's form encourages the pupil to memorize, instead of to reason out the matter, the result of which is that when he comes to the original exercises he is comparatively helpless.

That Professor Wentworth is thoroughly in earnest in his faith in his own method of presenting the subject, is shown by the opening clause of the preface to his first edition, in which he says: "Most persons do not possess, and do not easily acquire, the power of abstraction requisite for apprehending geometrical conceptions, and for keeping in mind the successive steps of continuous argument. Hence with a very large proportion of beginners in geometry, it depends mainly upon the form in which the subject is presented whether they pursue the study with indifference, not to say aversion, or with increasing interest and pleasure. In compiling the present treatise, the author has kept this fact constantly in view."

As we said in the beginning, we limit our remarks to geometry, but we believe that there is this same pernicious tendency, "to make things easy," in other text-books. In many cases the publishers are to blame for this, though it may show weakness on the part of the author to allow himself to be ruled by his publishers. It is natural that both the publisher and the author should desire, from a commercial standpoint at least, to make the book popular. And the fact that this making the book easy for the pupil at the same time simplifies it for a certain class of teachers, at once enhances the popularity of the book. So, at the bottom, our educational system may be responsible for some of our sugar-coated text-books, for it is a sad fact that many of our teachers are but poorly prepared for the work that they are called to do.

In conclusion, we hope that we have made it clear that our text-books on geometry are defective in this respect. A few demonstrations of the kind objected to might not be out of place at the beginning of the First Book for instance, or in

a very elementary geometry which is to be followed by a more advanced work. They would besides serve as examples to show the student how to write out his demonstrations on examinations. Byerly, in his edition of Chauvenet's Geometry, accomplishes this end in quite a successful way, we think, when, near the close of Book I, he gives his "Arrangement of Written Exercises." Our references heretofore have been to Chauvenet's own edition. Since writing the above, the writer has read the preface to Professor Byerly's "Abridged Edition of Chauvenet," and as this author's idea as to how the demonstrations should be given coincides so nearly with the views expressed above, he takes the liberty of closing this article with the following quotation from Professor Byerly's preface,— the italics are ours,— "In preparing this edition of Chauvenet's Geometry I have endeavored to compel the student *to think and to reason for himself*, and I have tried to emphasize the fact that he should not merely learn to understand and demonstrate a few set propositions, but that he should acquire the power of grasping and proving any simple geometrical truth that may be set before him ; and this power, it must be remembered, *can never be gained by memorizing* demonstrations. Systematic practice in devising proofs of new propositions is indispensable.

On this account the demonstrations of the main propositions, *which at first are full and complete, are gradually more and more condensed*, until at last they are sometimes reduced to mere hints, by the aid of which the full proof is to be developed ; and numerous additional theories and problems are constantly given as exercises for practice in original work."

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